

REMARKS

Claims 1-17 and 19 are pending. No claims have been amended, added, or canceled in this response. Claims 1-17 and 19 therefore will be pending upon the filing of this response.

Claims 1, 2, 4, 6, and 7 have been rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 6,196,871 (“the Szu patent”) in view of U.S. Patent No. 6,203,690 (“the Findeis patent”) and U.S. Patent No. 4,767,344 (“the Noschese patent”). Claims 8-11, 16, and 17 have been rejected under 35 U.S.C. §103(a) as being obvious over the Szu patent in view of the Noschese patent. Claims 3, 5, 13, and 15 have been rejected under 35 U.S.C. §103(a) as being obvious over the Szu patent in view of U.S. Patent No. 5,086,966 (“the Melton patent”). Claims 12 and 14 have been rejected under 35 U.S.C. §103(a) as being obvious over the Szu patent in view of the Findeis patent. Claim 19 has been rejected under 35 U.S.C. §103(a) as being obvious over the Szu patent in view of U.S. Patent No. 6,434,016 (“the Zeng patent”).

Reconsideration and withdrawal of the above rejections is respectfully requested, for the following reasons.

Claim 1 of the present application recites, *inter alia*, an electronic assembly, comprising a printed circuit substrate including a retentive through hole, . . . and an electrical connector, the electrical connector comprising . . . a retentive structure extending from the surface of the housing . . . and positioned within the through hole, . . . the retentive structure having a cross-sectional area smaller than an area of the through hole so that a clearance exists between the retentive structure and a periphery of the through hole; wherein at least some of the plating material separates from the base material at a reflow temperature of the

plurality of solder masses and combines with a solder composition within the through hole so that the solder composition and the plating material, upon cooling, form a bond between the printed circuit substrate and the retentive structure.

The circuit board (34), the adjusting posts (18), and the through holes (36) of the Szu patent have been characterized in the office action as a printed circuit structure, a retentive structure, and a through hole as recited in claim 1 of the present application (*office action at pg. 2, lines 13-15*). Each adjusting post (18) of the Szu patent includes a leg (24) that is “firmly received” in an associated through hole (36), and fixes the connector (10) to the circuit board (34) (*the Szu patent at col. 3, lines 18-25 and 53-57*). It has been acknowledged in the office action that the adjusting posts (18) do not have a cross-sectional area smaller than an area of the through holes (36) so that a clearance exists between the adjusting posts (18) and a periphery of the through holes (36) (*office action at pg. 3, lines 1-5*).

The printed circuit board (32) and the pin contacts (26) of the Noschese patent have been characterized in the office action as a printed circuit structure and a retentive structure, respectively, as recited in claim 1 of the present application (*office action at pg. 3, lines 18-22*). The pin contacts (26) are received in through holes (30) plated with copper plating (46). The gaps between each pin contact (26) and the associated copper plating (46) is filled by solder (48) (*the Noschese patent at col. 4, lines 14-18 and 51-55*).

It has been asserted in the office action that:

it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the retentive structure design of Noschese in Szu, as modified by, as modified [by the Findeis patent], for the purpose of permanently mounting the housing socket onto the circuit substrate (*office action at pg. 4, lines 5-8*).

Applicant respectfully disagrees with this assertion, because modifying the electrical socket (10) of the Szu patent as suggested in the office action would alter the principle of operation of the electrical socket (10) and render the electrical socket (10) unsuitable for its intended purpose. In addition, the Szu patent teaches away from combining the teachings of the Szu, Findeis, and Noschese patents. Moreover, combining the teaches of the Szu patent with those of the Noschese and Findeis patents represents an exercise of impermissible hindsight gained from the Applicants' own disclosure.

The electrical socket (10) of the Szu patent is electrically connected to the Szu circuit board (34) by solder balls (16) mounted on contacts (15). The connector (10) is subjected to a heat treatment process that melts the solder balls (16) to attach the solder balls (16) to corresponding contact pads (38) on the circuit board (34). The Szu patent addresses the need to maintain the solder balls (16) in alignment with the associated contact pads (38) during the heat treatment process:

[i]t is noted that during the heat treatment process or any significant change of the surrounding temperature, the connector 10 and the circuit board 34 experience different thermal expansions and shrinkage due to different CTS [coefficients of thermal expansion] thereof. However, since adjusting posts 18 accurately fix the connector 10 to the circuit board 34 whereby the bases 22 [of the adjusting posts 18] are received in the surrounding holes 14 of the connector 10 and the legs 24 are firmly received in corresponding half-through holes 361 of the circuit board, a fracture stress exerted on the solder balls 16 which may affect the deformation thereof can be greatly decreased. Likewise, the possibility of the misalignment between the contacts 15 and the contact pads 38 of the circuit board 34 is effectively eliminated (*the Szu patent at col. 3, lines 49-67*).

The adjusting posts (18) of the Szu patent have been characterized in the office action as a retentive structure as recited in claim 1 of the present application, as discussed above.

The use of the adjusting posts (18) as a means to maintain alignment between the solder balls

(16) and the corresponding contact pads (38) during the initial heat treatment process that melts the solder balls (16) requires that the legs (24) of the adjusting posts (18) be *firmly received* in the associated through holes (36) in the circuit board (34) at the start of the initial heat treatment process.

Modifying the Szu electrical socket (10) so that the adjusting posts (18) have a cross-sectional area smaller than the area of the through holes (36), i.e., altering the adjusting posts (18) or the through holes (36) so that the adjusting posts (18) are not firmly received by the through holes (36), would preclude the adjusting posts (18) from performing their alignment function, and would thus alter the principle of operation of the Szu electrical socket (10) and render the electrical socket (10) unsatisfactory for its intended purpose.

If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious (*Manual of Patent Examining Procedure, Eighth Edition, Rev. 5, Aug. 2006, § 2143.01*).

Modifying the electrical socket (10) of the Szu patent based on the teachings of the Noschese patent to make the adjusting posts (18) have a cross-sectional area smaller than an area of the through holes (36) so that a clearance exists between the adjusting posts (18) and a periphery of the through holes (36) would alter the principle of operation of the Szu electrical socket (10), and render the electrical socket (10) unsatisfactory for its intended purpose. Applicant therefore respectfully submits that it would not have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the

Szu, Findeis, and Noschese patents, or any of the other prior art references of record, to arrive at the electronic assembly recited in claim 1 of the present application.

Moreover, sizing the retentive structure of claim 1 of the present application smaller than the through hole of the printed circuit substrate recited in claim 1 and applying solder in the through hole permits the solder mass to float during reflow, resulting in self-alignment and ultimately a low stress solder joint (*original application at paragraph [0006]*). The Szu patent, by contrast, teaches the use of adjusting posts (18) with legs (24) that are *firmly received* in through holes (36) in the circuit board (34), to maintain alignment between solder balls (16) and contact pads (38) on the circuit board (34) during the heat treatment process that melts the solder balls (16) (*the Szu patent at col. 3, lines 49-67*). The Szu patent thus teaches away from the use of a retentive structure having a cross-sectional area smaller than an area of the through hole so that a clearance exists between the retentive structure and a periphery of the through hole.

It is improper to combine references where the references teach away from their combination (*Manual of Patent Examining Procedure, Eighth Edition, Rev. 5, Aug. 2006, at § 2145*) (*citations omitted*).

Because the Szu patent teaches away from the use of a retentive structure having a cross-sectional area smaller than an area of the through hole so that a clearance exists between the retentive structure and a periphery of the through hole, Applicant respectfully submits that it would not have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the Szu, Findeis, and Noschese patents, or any of the other prior art references of record, to arrive at the electronic assembly recited in claim 1 of the present application.

Furthermore, it has been asserted in the office action that one of ordinary skill in the art would have found it obvious at the time of invention “to use the retentive structure design of Noschese in Szu . . . for the purpose of permanently mounting the housing socket onto the circuit substrate” (*office action at pg. 4, lines 5-8*).

Applicant respectfully notes that the legs (24) of the adjusting posts (18) of the Szu patent permanently fix the electrical socket (10) to the circuit board (34) (*the Szu patent at col. 3, lines 45-47 and Figure 4B*). Applicant therefore respectfully submits one of ordinary skill in the art would not have looked to the Noschese patent for the teaching of permanently mounting the housing socket (10) of the Szu patent onto the Szu circuit board (34).

When applying 35 U.S.C. § 103(a), the references must be viewed without the benefit of impermissible hindsight afforded by the claimed invention. To make a proper obviousness determination, the examiner must “step backward in time and into the shoes worn by the hypothetical ‘person of ordinary skill in the art’ when the invention was unknown and just before it was made.” In view of the available factual information, the examiner must make a determination as to whether the claimed invention “as a whole” would have been obvious at that time to a person of ordinary skill in the art. A rejection based on these criteria must be based on what is taught in the prior art, not the applicant’s disclosure. The legal conclusion of obviousness must be reached on the basis of the facts gleaned from the prior art (*Manual of Patent Examining Procedure, Eighth Edition, Rev. 5, Aug. 2006, at § 2142*).

Because one of ordinary skill in the art would not have looked to the Noschese patent, or any of the other prior-art references of record, for the teaching of permanently mounting the housing socket (10) of the Szu patent onto the Szu circuit board (34), Applicant respectfully submits that the rejection of claim 1 set forth in the office action has been

constructed based on the Applicant's own disclosure using impermissible hindsight, rather than facts gleaned from the prior art.

Applicant respectfully submits that claim 1 of the present application is not obvious over the Szu patent in view of Findeis and Noschse patents, or any of the other prior-art references of record, based on the above remarks. Withdrawal of the rejection of claim 1 (and claims 2-7 and 19, which depend therefrom) under 35 U.S.C. 103(a) is respectfully requested.

Independent claim 8 of the present application recites, *inter alia*, a retentive structure extending from the surface of the housing, spaced apart from the plurality of solder masses, and positioned within the through hole, the retentive structure having a cross-sectional area smaller than an area of the through hole so that a clearance exists between the retentive structure and a periphery of the through hole. Applicant therefore respectfully submits that claim 8 is patentably distinct from the Szu and Noschese patents, and the other prior art references of record, for substantially the same reasons discussed above in relation to claim 1. Withdrawal of the rejection of claim 8 under 35 U.S.C. 103(a) is respectfully requested.

Claim 9 of the present application recites, *inter alia*, the retentive structure made with a material that alters a physical property of a solder composition in contact with the retentive structure within the through hole at a reflow temperature of such a solder composition. It has been acknowledged in the office action that the Szu patent does not disclose these features.

It has been asserted in the office action in relation to claim 9 that one of ordinary skill in the art would have found it obvious at the time of invention "to use the retentive structure design of Noschese in Szu for the purpose of permanently mounting the housing socket onto the circuit substrate" (*office action at pg. 8, lines 3-5*). Applicant respectfully submits that

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37 CFR § 1.116**

combining the teachings of the Szu and Noschese patents based on this reasoning represents an exercise of impermissible hindsight, for the reasons discussed above in relation to claim 1. Applicant therefore respectfully submits that claim 9 is patentably distinct from the Szu and Noschese patents, and the other prior art references of record. Withdrawal of the rejection of claim 9 (and claims 10-16, which depend therefrom) under 35 U.S.C. 103(a) is respectfully requested.

Claim 17 of the present application recites, *inter alia*, the retentive structure comprising a material that combines with a solder composition within the through hole such that after initial affixation of the solder masses with the circuit substrate, affixation at the solder masses is compromised, due to an elevated temperature, prior to affixation at the retentive structure.

It has been asserted in the office action in relation of claim 17 that one of ordinary skill in the art would have found it obvious at the time of invention “to use the retentive structure design of Noschese in Szu, for the purpose of permanently mounting the housing socket onto the circuit substrate” (*office action at pg. 9, lines 16-18*). Applicant respectfully submits that combining the teachings of the Szu and Noschese patents based on this reasoning represents an exercise of impermissible hindsight, for the reasons discussed above in relation to claim 1. Applicant therefore respectfully submits that claim 17 is patentably distinct from the Szu and Noschese patents, and the other prior art references of record. Withdrawal of the rejection of claim 17 under 35 U.S.C. 103(a) is respectfully requested.

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A notice of allowability is respectfully requested.

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